Lingnan University
Department of Philosophy

Course Title	:	Probability and Scientific Method
Course Code	:	PHI3370
Recommended Study Year	:	3rd Year
No. of Credits/Term	:	3
Mode of Tuition	:	Lecture and tutorial
Class Contact Hours	:	2 hours Lecture/week; 1 hour Tutorial/week
Category in Major Programme	:	Programme Elective - Philosophy of Natural and Human Sciences Profile
Prerequisite(s)	:	PHI3101 Deductive Logic
Co-requisite(s)	:	N/A
Exclusion(s)	:	N/A
Exemption Requirement(s)	:	N/A

Brief Course Description

"Probability is the very guide of life", as Bishop Butler said in the 18th century. Nowadays, probability and statistics crowd in upon us. Births, marriages, deaths, drugs, commercial enterprises, and education – nothing escapes. Probability became the centrepiece of natural and social science. The course is intended as a survey of philosophical issues about probability and its relationship to scientific method. Topics include: interpretations of probability, the probability calculus, probability and inductive logic, paradoxes about induction, uncertainty and rational decision.

Aims

1. Introduce students to some central theories of probability and problems in the philosophy of probability;
2. Enhance students' understanding of probability and its relationship to scientific method.

Learning Outcomes

After completing this course, the students will be able to

1. grasp elementary probability calculus and understand different interpretations of the calculus;
2. describe and evaluate the basic ideas of different statistical methodologies associated with different interpretations of probability;
3. recognize and avoid fallacies in thinking about probability; and
4. critically assess arguments that involve probabilities.

Indicative Content

1. A brief history of probability
2. Interpretations of probability
    i. Probability as a measure of belief
    ii. Probability as relative frequency
    iii. Probability as the truth-frequency of types of arguments
3. The probability calculus
    i. Probability, arguments, statements, and properties
    ii. Disjunction and negation rules
    iii. Conjunction rules and conditional rules
    iv. Expected value of a gamble
    v. Bayes' theorem
4. Four paradoxes about induction

   i. The classical problem of induction
   ii. The paradox of the ravens
   iii. The 'grue' paradox
   iv. The lottery paradox
5. Probability and scientific inductive logic
   i. Hypothesis and deduction
   ii. Quantity and variety of evidence
   iii. Total evidence
   iv. Convergence to the truth
6. Uncertainty and rational decision
   i. Framing the decision problem
   ii. Decisions under uncertainty
   iii. The expected utility method
   iv. The prisoner's dilemma

Teaching Method
Lectures and tutorials

Measurement of Learning Outcomes
Students' progress towards the learning outcomes will be measured by:
(1) participation in tutorial discussions (LO2, LO3 and LO4)
(2) in-class quizzes (LO1, LO2 and LO3)
(3) essays (LO2 and LO4)
(4) final examination (LO1, LO2, and LO3)

Assessment
30% Class participation, including discussions (15%) and in-class quizzes (15%)
30% Essay assignments
40% Final Examination

Required Readings
Skyrms, Brian, *Choice & Chance: An Introduction to Inductive Logic*, 4th edition, Belmont, CA: Wadsworth/Thomson Learning, 2000.
史克姆斯，汪永祺譯，《選擇與機會：歸納邏輯導論》，臺北：結構群文化事業有限公司，1991年。

Supplementary Readings
Cohen, L. J, *An Introduction to the Philosophy of Induction and Probability*, Oxford: Clarendon Press, 1989.
Gillies, D. A., *An Objective Theory of Probability*, London: Methuen & CO LTD, 1973.
Hacking, Ian, *An Introduction to Probability and Inductive Logic*, New York: Cambridge University Press, 2001.
Hacking, Ian, *The Taming of Chance*, Cambridge: Cambridge University Press, 1990.
伊恩・哈金，劉鋼譯，《馴服偶然》，北京：中央編譯出版社，2000年。
Hacking, Ian, *Logic of Statistical Inference*, Cambridge: Cambridge University Press, 1965.

<u>Important Notes</u>

(1) Students are expected to spend a total of 9 hours (i.e. 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.

(2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examinations. In particular, plagiarism, being a kind of dishonest practice, is "the presentation of another person's work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student's own work". Students are required to strictly follow university regulations governing academic integrity and honesty.
(3) Students are required to submit writing assignment(s) using Turnitin.
(4) To enhance students' understanding of plagiarism, a mini-course "Online Tutorial on Plagiarism Awareness" is available on https://pla.ln.edu.hk/